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RESULTS OF THE DECONTAMINATION OF THE UFA WATER SYSTEM BY ULTRAVIOLET IRRADIATION FROM AN AKKH APPARATUS

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RESULTS OF THE DECONTAMINATION OF THE UFA WATER SYSTEM
BY ULTRAVIOLET IRRADIATION FROM AN AKKh APPARATUS

Following is the translation of an article by Candidate of Medical Sciences Ya. N. Askarrova entitled "Resul'taty Obezzerazhivaniya Vody Ufimskogo Vodoprovoda Ultrafioletovym Oblucheniyem Pri Pomoshchi Ustanovki AKKh" (English version above) in *Gigiyena i Sanitariya* (Hygiene and Sanitation), Vol. 25, No. 5, 1960, Moscow, page 102.¹

From Bashkir Medical Institute

During 1954 we studied the efficacy of decontaminating water with ultraviolet lamps in the bactericidal installation of the Academy of Communal Economy (A.C.E.).¹

The installation has two sections (active and reserve). Each section has three cylindric chambers of stainless steel. In the center of the chamber a quartz cylinder is mounted inside a high pressure type PRK-7 mercury-quartz lamp. The output of the pumping station within which the bactericidal installation operates, according to information obtained from the Ufa Water Canal Organization, consists of 150-200 m³ water per hour.

Ninety bacteriologic tests (determination of titers and general quantitation of Colibacilli per ml) and 70 standard chemical sanitary analyses were performed. Water was collected from the water system's conduits prior to irradiation and from pump faucets after irradiation. Furthermore, water samples from rivers, representing regional locations of stations of primary development, were tested. During the construction of ducts along the riverside, obtention of soft water by uniform filtration through gravel deposits was kept in mind. In fact, during the first year of operation of the water system (according to O. A. Smorodintzev's data) the water was of the soft type; but in subsequent years a sharp difference was detected, which increased with the years. Thus, the general

¹Hygiene and Sanitation, No. 10, 1953.

hardness of water was about 12° in 1900, and was raised to 38.6° in 1954.

Nowadays the water system contains subsoil water, its constitution bearing no resemblance to river water.

Unlike soft water, it is very hard, its general hardness attaining 40° . The latter is two times greater than the hardness of carbonate. According to organoleptic and chemical analysis, water from the water system is very pure by comparison with river water: its limpidity is always over 30 cm of Snellen, and no strange odors are disclosed during the majority of the tests.

However, a few substreams of river water exist where odors peculiar to soft water are shown to occur now and then. According to the date of our bacteriologic analyses, the water was harmless and also fundamentally pure, its Colibacillus titer being equal or less than one per 500 ml in 86 percent of the samples, with an average of three colonies per ml of water. Even in springtime no deterioration of the bacteriologic count of the water was noted, the Colibacillus titer remaining within the same limits in the majority of tests.

However, in 14 percent of the test samples the Colibacillus titer was below the required standard (i.e., one per 333 ml). Nowadays such variations, showing fecal pollution of natural water, exist before its decontamination. After irradiation of the water in a bactericidal installation, the Colibacillus titer was decreased and was equal to or less than one per 500 ml in 93 percent. The number of microbes per ml of water after ultraviolet irradiation decreased about three times on the average.

Studies of the bacterial pollution showed a relationship between the amount of irradiation of the water and the time of prophylactic examination. Our demonstration of occasional increase of the Colibacillus titer in irradiated water (now and then, to one per 91 ml) was based on tests undertaken more recently in the course of prophylactic examination during operation of the quartz cylinder apparatus for surface decontamination of the water system (generally over a 25 hour period).

The duration of decontamination by running the water through the apparatus' cylinders was such that the latter were covered with an appreciable layer of hard coating which absorbed a considerable portion of the ultraviolet irradiation and lowered the degree of decontamination activity of the apparatus. The effect of the bactericidal decontamination of water was reduced in those cases where substitution of old cylinders by new ones occurred infrequently (every two years). It is likely that during

intensive irradiation, water is negatively influenced by the decrease of reflecting surface in the chamber which results from the deposition of the coating. At the time of our examination, the walls of the chamber had not been cleaned.

Conclusions

1. Purification of water by the action of ultraviolet light from an AKKh apparatus is effective in the old Ufa water system.
2. For constant bactericidal activity, the apparatus' cylinders must be cleansed more frequently (every two weeks), the old tarnished quartz cylinders must be replaced more frequently by new ones, and the walls of the chambers must be cleaned of sediment.

END

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